

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
25 September 2008 (25.09.2008)

PCT

(10) International Publication Number  
WO 2008/115530 A3

- (51) International Patent Classification:  
G03F 7/00 (2006.01)
- (21) International Application Number:  
PCT/US2008/003629
- (22) International Filing Date: 20 March 2008 (20.03.2008)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
60/895,883 20 March 2007 (20.03.2007) US  
60/975,608 27 September 2007 (27.09.2007) US

(74) Agents: FEATHERSTONE, Donald, J. et al.; Sterne, Kessler, Goldstein & Fox P.L.L.C., 1100 New York Avenue, N.W., Washington, DC 20005-3934 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(71) Applicant (for all designated States except US): NANO TERRA INC. [US/US]; 790 Memorial Drive, Suite 202, Cambridge, MA 02139 (US).

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

- (72) Inventors; and
- (75) Inventors/Applicants (for US only): COFFEY, David, Christopher [US/US]; 630 South 44th Street, Boulder, CO 80305 (US). AGARWAL, Sandip [IN/US]; 74 Craigle Street #31, Somerville, MA 02143 (US). DICKEY, Kimberly [US/US]; 7912 Sandy Bottom Way, Raleigh, NC 27613 (US). MAYERS, Brian, T. [US/US]; 40 Vinal Avenue #3, Somerville, MA 02143 (US). CARBECK, Jeffrey [US/US]; 124 Radcliffe Road, Belmont, MA 02478 (US).

**Published:**  
— with international search report  
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(88) Date of publication of the international search report:  
4 June 2009



WO 2008/115530 A3

(54) Title: POLYMER COMPOSITION FOR PREPARING ELECTRONIC DEVICES BY MICROCONTACT PRINTING PROCESSES AND PRODUCTS PREPARED BY THE PROCESSES

(57) Abstract: The present invention is directed to methods for patterning substrates using contact printing processes and inks comprising an organic semiconductive or semiconductive polymer, inks for use with the processes, and products formed by the processes.

**A. CLASSIFICATION OF SUBJECT MATTER**  
 INV. G03F7/00

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

 Minimum documentation searched (classification system followed by classification symbols)  
 G03F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	WO 01/08242 A (E INK CORP [US]) 1 February 2001 (2001-02-01) page 6, line 23 - page 7, line 11; claims 5,17,20,21  page 17, line 28 - page 18, line 21 -----	1,5,6, 12,17-24 2-4, 7-11, 13-15
X Y	US 2003/152703 A1 (HAMMOND PAULA T [US] ET AL) 14 August 2003 (2003-08-14) paragraph [0096]; claims 1,2,12,21,24; figure 7 -----	1,5,6, 17-24 2-4, 7-11, 13-15
Y	US 2002/098364 A1 (BERNARD ANDRE [CH] ET AL BERNARD ANDRE [CH] ET AL) 25 July 2002 (2002-07-25) claims 1-29 -----	1,13-15
	-/--	

 Further documents are listed in the continuation of Box C.

 See patent family annex.

## \* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*&\* document member of the same patent family

Date of the actual completion of the international search

29 January 2009

Date of mailing of the international search report

22/04/2009

Name and mailing address of the ISA/

 European Patent Office, P.B. 5818 Patentlaan 2  
 NL - 2280 HV Rijswijk  
 Tel. (+31-70) 340-2040,  
 Fax: (+31-70) 340-3016

Authorized officer

Thiele, Norbert

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2004/004025 A (INFINEON TECHNOLOGIES AG [DE]; ZSCHIESCHANG UTE [DE]; HALIK MARCUS [DE] 8 January 2004 (2004-01-08) claims 1,5,9,12 -----	1
A	WO 2004/093507 A (MATSUSHITA ELECTRIC IND CO LTD [JP]; NAKAGAWA TOHRU) 28 October 2004 (2004-10-28) claims 1,5,9,12 -----	1-24
A	DONZEL C ET AL: "HYDROPHILIC POLY(DEIMTHYLSILOXANE) STAMPS FOR MICROCONTACT PRINTING" ADVANCED MATERIALS, WILEY VCH, WEINHEIM, DE, vol. 13, no. 15, 3 August 2001 (2001-08-03), pages 1164-1167, XP001129646 ISSN: 0935-9648 the whole document -----	1,13-15
A	PRISSANAROON W ET AL: "Microcontact printing of copper and polypyrrole on fluoropolymers" THIN SOLID FILMS, ELSEVIER-SEQUOIA S.A. LAUSANNE, CH, vol. 477, no. 1-2, 22 April 2005 (2005-04-22), pages 131-139, XP004772270 ISSN: 0040-6090 the whole document -----	1-24
E	WO 2008/060592 A (UNIV MICHIGAN STATE [US]; LEE ILSOON [US]; DRZAL LAWRENCE T [US]; LU J) 22 May 2008 (2008-05-22) claims 1,4,7,12-18 -----	1-24

**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1.  As all required additional search fees were timely paid by the applicant, this international search report covers allsearchable claims.
  
2.  As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
  
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-24

**Remark on Protest**

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

## 1. claims: 1-24

Process for forming a conductive or semiconductive pattern on a substrate, the pattern having a certain minimum electron or hole mobility by providing a stamp with a pattern, applying an ink comprising a conductive or semiconductive polymer and a solvent on the stamp, and contacting the stamp with the substrate to transfer on the substrate, wherein the stamp surface may be pretreated prior to the applying.

---

## 2. claims: 25-28

Elastomeric stamp composition comprising

- an elastomeric stamp optionally being coated with a metal and having a SAM species on the metal, the stamp having a body and a surface including at least one protrusion with face and sidewall portions, the face comprising a first elastomer and the body comprising a second elastomer;
- a first solvent present in the body and being in fluid communication with the face portion;
- an ink composition comprising a conductive or semiconductive polymer and a solvent, the ink coating the face portion.

---

## 3. claims: 29-34

A composition comprising a SAM-forming species and preferably a second SAM-forming species having a structure -L-M-X, wherein -L- is a linker group preferably selected from a given list, which suitable for covalently bonding the SAM-forming species to a metal surface and covering the surface uniformly, -M- is a hydrocarbon or heteroaryl selected from a given list, and -X is terminal group preferably selected from a given list.

---

## 4. claims: 35,36

Polymer ink composition consisting of 0.1% to 5% of a conductive or semiconductive polymer, a first solvent having a vapor pressure lower than a given limit value, second solvent having a higher vapor pressure than the first solvent, and which is preferably toluene, whereby the conductive or semiconductive polymer has a certain minimum solubility in the second solvent.

---

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 0108242	A	01-02-2001	AU 7137800 A EP 1198852 A1 JP 2003505889 T	13-02-2001 24-04-2002 12-02-2003
US 2003152703	A1	14-08-2003	US 2004086709 A1	06-05-2004
US 2002098364	A1	25-07-2002	JP 3496831 B2 JP 2002206033 A	16-02-2004 26-07-2002
WO 2004004025	A	08-01-2004	DE 10229118 A1	29-01-2004
WO 2004093507	A	28-10-2004	CN 1774962 A DE 602004004519 T2 EP 1614329 A1 JP 2006523014 T KR 20050114675 A US 2006228533 A1	17-05-2006 08-11-2007 11-01-2006 05-10-2006 06-12-2005 12-10-2006
WO 2008060592	A	22-05-2008	NONE	